

# **Apprenticeship and Industry Training**

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## **Metal Fabricator (Fitter) Apprenticeship Course Outline**

**2614.1 (2014)**

*Alberta*



Apprenticeship and  
Industry Training

**ALBERTA ADVANCED EDUCATION**

***Metal Fabricator (Fitter): apprenticeship course outline***

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**Course Outline**

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## **Apprenticeship**

Apprenticeship is post-secondary education with a difference. Apprenticeship begins with finding an employer. Employers hire apprentices, pay their wages and provide on-the-job training and work experience. Approximately 80 per cent of an apprentice's time is spent on the job under the supervision of a certified journeyman or qualified tradesperson. The other 20 per cent involves technical training provided at, or through, a post-secondary institution – usually a college or technical institute.

To become certified journeymen, apprentices must learn theory and skills, and they must pass examinations. Requirements for certification—including the content and delivery of technical training—are developed and updated by the Alberta Apprenticeship and Industry Training Board on the recommendation of Metal Fabricator (Fitter) Provincial Apprenticeship Committee.

The graduate of the Metal Fabricator (Fitter) apprenticeship program is a certified journeyman who will be able to:

- apply all applicable Codes and Regulations with reference to materials, its uses and safety
- understand and apply the principles of drafting, how drawings originate, and how to correctly interpret the information given - the use of each type and the related work orders, materials lists, etc.
- work with shop fabrication, preparation, lay-out, assembly or repair of structural and miscellaneous components and vessel fabrication
- perform a satisfactory operation with oxy-fuel or electric arc welding/cutting equipment in order to facilitate this work
- be proficient in the safe use and maintenance of hand and power tools
- be familiar with the work of other tradesmen in affiliated trades
- perform the necessary functions required to fabricate, assemble vessel, structural and miscellaneous metal work, within the scope of a structural steel and/or vessel fabricating or manufacturing facility or shop
- perform assigned tasks in accordance with quality and production standards required by industry

## **Apprenticeship and Industry Training System**

### **Industry-Driven**

Alberta's apprenticeship and industry training system is an industry-driven system that ensures a highly skilled, internationally competitive workforce in more than 50 designated trades and occupations. This workforce supports the economic progress of Alberta and its competitive role in the global market. Industry (employers and employees) establishes training and certification standards and provides direction to the system through an industry committee network and the Alberta Apprenticeship and Industry Training Board. The Alberta government provides the legislative framework and administrative support for the apprenticeship and industry training system.

### **Alberta Apprenticeship and Industry Training Board**

The Alberta Apprenticeship and Industry Training Board provides a leadership role in developing Alberta's highly skilled and trained workforce. The board's primary responsibility is to establish the standards and requirements for training and certification in programs under the Apprenticeship and Industry Training Act. The board also provides advice to the Minister of Advanced Education on the needs of Alberta's labour market for skilled and trained workers, and the designation of trades and occupations.

The thirteen-member board consists of a chair, eight members representing trades and four members representing other industries. There are equal numbers of employer and employee representatives.

### **Industry Committee Network**

Alberta's apprenticeship and industry training system relies on a network of industry committees, including local and provincial apprenticeship committees in the designated trades, and occupational committees in the designated occupations. The network also includes other committees such as provisional committees that are established before the designation of a new trade or occupation comes into effect. All trade committees are composed of equal numbers of employer and employee representatives. The industry committee network is the foundation of Alberta's apprenticeship and industry training system.

### **Local Apprenticeship Committees (LAC)**

Wherever there is activity in a trade, the board can set up a local apprenticeship committee. The board appoints equal numbers of employee and employer representatives for terms of up to three years. The committee appoints a member as presiding officer. Local apprenticeship committees:

- monitor apprenticeship programs and the progress of apprentices in their trade, at the local level
- make recommendations to their trade's provincial apprenticeship committee (PAC) about apprenticeship and certification in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- make recommendations to the board about the appointment of members to their trade's PAC
- help settle certain kinds of disagreements between apprentices and their employers
- carry out functions assigned by their trade's PAC or the board

### **Provincial Apprenticeship Committees (PAC)**

The board establishes a provincial apprenticeship committee for each trade. It appoints an equal number of employer and employee representatives, and, on the PAC's recommendation, a presiding officer - each for a maximum of two terms of up to three years. Most PACs have nine members but can have as many as twenty-one. Provincial apprenticeship committees:

- Make recommendations to the board about:
  - standards and requirements for training and certification in their trade
  - courses and examinations in their trade
  - apprenticeship and certification
  - designation of trades and occupations
  - regulations and orders under the Apprenticeship and Industry Training Act
- monitor the activities of local apprenticeship committees in their trade
- determine whether training of various kinds is equivalent to training provided in an apprenticeship program in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- consult with other committees under the Apprenticeship and Industry Training Act about apprenticeship programs, training and certification and facilitate cooperation between different trades and occupations
- consult with organizations, associations and people who have an interest in their trade and with employers and employees in their trade
- may participate in resolving certain disagreements between employers and employees
- carry out functions assigned by the board

### **Metal Fabricator (Fitter) PAC Members at the Time of Publication**

|                    |            |                   |
|--------------------|------------|-------------------|
| Mr. J. Gillen      | Calgary    | Presiding Officer |
| Mr. N. Carrington  | Calgary    | Employer          |
| Mr. P. Devine      | Edmonton   | Employer          |
| Mr. C. Welcher     | Calgary    | Employer          |
| Mr. J. Petruska    | Strathmore | Employer          |
| Mr. T. Cooley      | Calgary    | Employee          |
| Mr. J. Ganczar     | Nisku      | Employee          |
| Mr. G. Hunter      | Edmonton   | Employee          |
| Mr. H. Swankhuizen | Edmonton   | Employee          |

### **Alberta Government**

Alberta Advanced Education works with industry, employer and employee organizations and technical training providers to:

- facilitate industry's development and maintenance of training and certification standards
- provide registration and counselling services to apprentices and employers
- coordinate technical training in collaboration with training providers
- certify apprentices and others who meet industry standards

## Technical Institutes and Colleges

The technical institutes and colleges are key participants in Alberta's apprenticeship and industry training system. They work with the board, industry committees and Alberta Advanced Education to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship programs. They develop lesson plans from the course outlines established by industry and provide technical training to apprentices.

## Apprenticeship Safety

Safe working procedures and conditions, incident/injury prevention, and the preservation of health are of primary importance in apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of government, employers, employees, apprentices and the public. Therefore, it is imperative that all parties are aware of circumstances that may lead to injury or harm.

Safe learning experiences and healthy environments can be created by controlling the variables and behaviours that may contribute to or cause an incident or injury. By practicing a safe and healthy attitude, everyone can enjoy the benefit of an incident and injury free environment.

## Alberta Apprenticeship and Industry Training Board Safety Policy

The Alberta Apprenticeship and Industry Training Board (board) fully supports safe learning and working environments and emphasizes the importance of safety awareness and education throughout apprenticeship training- in both on-the- job training and technical training. The board also recognizes that safety awareness and education begins on the first day of on-the-job training and thereby is the initial and ongoing responsibility of the employer and the apprentice as required under workplace health and safety training. However the board encourages that safe workplace behavior is modeled not only during on-the-job training but also during all aspects of technical training, in particular, shop or lab instruction. Therefore the board recognizes that safety awareness and training in apprenticeship technical training reinforces, but does not replace, employer safety training that is required under workplace health and safety legislation.

The board has established a policy with respect to safety awareness and training:

**The board promotes and supports safe workplaces, which embody a culture of safety for all apprentices, employers and employees. Employer required safety training is the responsibility of the employer and the apprentice, as required under legislation other than the *Apprenticeship and Industry Training Act*.**

The board's complete document on its 'Apprenticeship Safety Training Policy' is available at [www.tradesecrets.alberta.ca](http://www.tradesecrets.alberta.ca); access the website and conduct a search for 'safety training policy'.

Implementation of the policy includes three common safety learning outcomes and objectives for all trade course outlines. These common learning outcomes ensure that each course outline utilizes common language consistent with workplace health and safety terminology. Under the title of 'Standard Workplace Safety', this first section of each trade course outline enables the delivery of generic safety training; technical training providers will provide trade specific examples related to the content delivery of course outline safety training.

## Occupational Health and Safety

A tradesperson is often exposed to more hazards than any other person in the work force and therefore should be familiar with and apply the Occupational Health and Safety Act, Regulations and Code when dealing with personal safety and the special safety rules that apply to all daily tasks.

Occupational Health and Safety (a division of Alberta Human Services) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at [www.humanservices.alberta.ca](http://www.humanservices.alberta.ca)

## **Technical Training**

Apprenticeship technical training is delivered by the technical institutes and many colleges in the public post-secondary system throughout Alberta. The colleges and institutes are committed to delivering the technical training component of Alberta apprenticeship programs in a safe, efficient and effective manner. All training providers place great emphasis on safe technical practices that complement safe workplace practices and help to develop a skilled, safe workforce.

The following institutions deliver Metal Fabricator (Fitter) apprenticeship technical training:  
Northern Alberta Institute of Technology South Campus

### **Procedures for Recommending Revisions to the Course Outline**

Advanced Education has prepared this course outline in partnership with the Metal Fabricator (Fitter) Provincial Apprenticeship Committee.

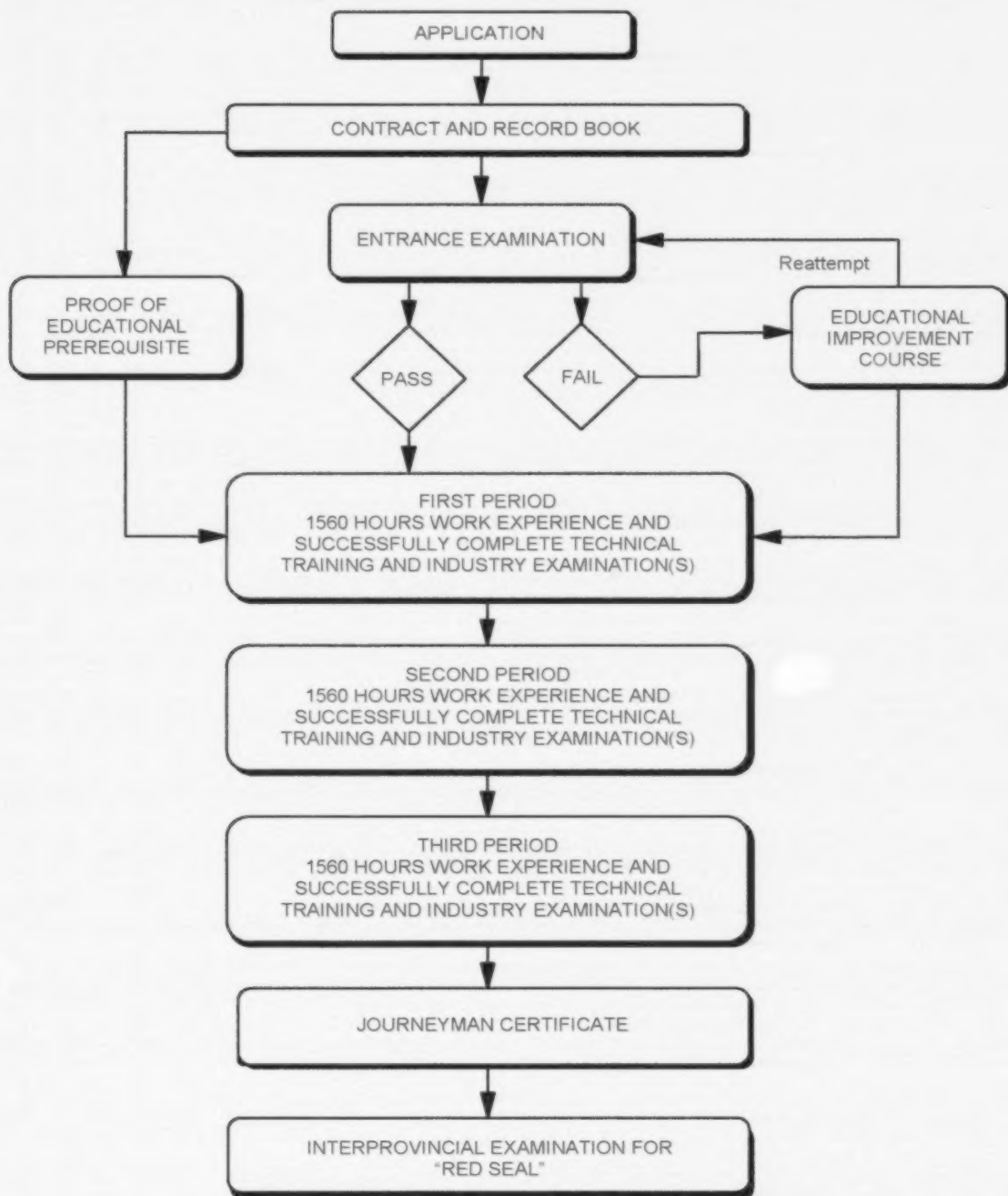
This course outline was approved on Dec 13, 2013 by the Alberta Apprenticeship and Industry Training Board on a recommendation from the Provincial Apprenticeship Committee. The valuable input provided by representatives of industry and the institutions that provide the technical training is acknowledged.

Any concerned individual or group in the province of Alberta may make recommendations for change by writing to:

Metal Fabricator (Fitter) Provincial Apprenticeship Committee  
c/o Industry Programs and Standards  
Apprenticeship and Industry Training  
Advanced Education  
10th floor, Commerce Place  
10155 102 Street NW  
Edmonton AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used. Recommendations for change will be placed on the agenda for regular meetings of the Metal Fabricator (Fitter) Provincial Apprenticeship Committee.

### Apprenticeship Route toward Certification



**Metal Fabricator (Fitter) Training Profile**  
**FIRST PERIOD**  
**(8 Weeks 30 Hours per Week – Total of 240 Hours)**

**SECTION ONE**

**SAFETY, RIGGING, CRANES  
AND HOISTS**  
**53 HOURS**



**A**  
 Safety Legislation,  
Regulations & Industry Policy  
in the Trades  
**4 Hours**

**B**  
 Climbing, Lifting, Rigging  
and Hoisting  
**3 Hours**

**C**  
 Hazardous Materials & Fire  
Protection  
**2 Hours**

**D**  
 Trade Safety  
**10 Hours**

**E**  
 Hand Tools  
**8 Hours**

**F**  
 Power Tools  
**5 Hours**

**G**  
 Rigging  
**14 Hours**

**H**  
 Hoisting and Material  
Handling  
**7 Hours**

**SECTION TWO**

**LAYOUT AND FABRICATION**  
**70 HOURS**



**A**  
 Introduction to Layout  
**30 Hours**

**B**  
 Templates and Material  
Mark-up  
**10 Hours**

**C**  
 Fabrication  
**18 Hours**

**D**  
 Basic Pressure Vessels  
**12 Hours**

**SECTION THREE**

**MATH AND DRAWING  
INTERPRETATION**  
**66 HOURS**



**A**  
 Drawing Standards  
**28 Hours**

**B**  
 Material Designations  
**16 Hours**

**C**  
 Trade Mathematics  
**22 Hours**

**SECTION FOUR**

**CUTTING, WELDING AND  
METALLURGY**  
**51 HOURS**



**A**  
 Cutting  
**19 Hours**

**B**  
 Welding  
**22 Hours**

**C**  
 Metallurgy  
**10 Hours**

**Second Period**  
**(8 Weeks 30 Hours per Week - Total of 240 Hours)**

**SECTION ONE**

**MATERIAL HANDLING,  
EQUIPMENT OPERATIONS**  
**60 HOURS**



**A**

Equipment Operations  
**44 Hours**

**B**

Hoisting and Material  
Handling  
**12 Hours**

**C**

New Technology  
**4 Hours**

**SECTION TWO**

**LAYOUT AND FABRICATION**  
**62 HOURS**



**A**

Pattern Development  
**22 Hours**

**B**

Fabrication  
**40 Hours**

**SECTION THREE**

**MATH AND DRAWING  
INTERPRETATION**  
**54 HOURS**



**A**

Drawing Standards  
**24 Hours**

**B**

Welding Abbreviations and  
Symbols  
**8 Hours**

**C**

Trade Mathematics  
**22 Hours**

**SECTION FOUR**

**CUTTING, WELDING AND  
METALLURGY**  
**64 HOURS**



**A**

Cutting  
**28 Hours**

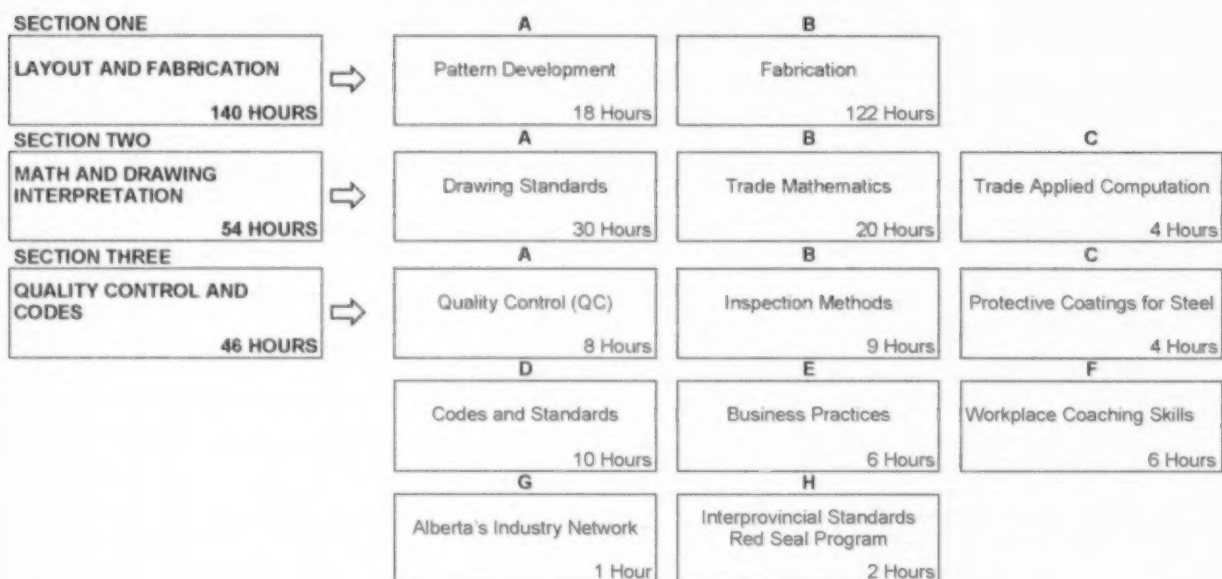
**B**

Welding  
**24 Hours**

**C**

Metallurgy  
**12 Hours**

**Third Period**  
**(8 Weeks 30 Hours Per Week - Total of 240 Hours)**



NOTE: The hours stated are for guidance and should be adhered to as closely as possible. However, adjustments must be made for rate of apprentice learning, statutory holidays, registration and examinations for the training establishment and Apprenticeship and Industry Training.

**FIRST PERIOD TECHNICAL TRAINING  
METAL FABRICATOR (FITTER) TRADE  
COURSE OUTLINE**

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE WILL BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

**SECTION ONE:..... SAFETY, RIGGING, CRANES AND HOISTS ..... 53 HOURS**

**A. Safety Legislation, Regulation & Industry Policy in the Trades ..... 4 Hours**

**Outcome:**      *Describe legislation, regulations and practices intended to ensure a safe work place in this trade.*

1. Demonstrate the ability to apply the Occupational Health and Safety Act, Regulation and Code.
2. Explain the role of the employer and employee in regard to Occupational Health and Safety (OH&S) regulations, Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, Workers Compensation Board regulations, and related advisory bodies and agencies.
3. Explain industry practices for hazard assessment and control procedures.
4. Describe the responsibilities of workers and employers to apply emergency procedures.
5. Describe professional accident prevention procedures and attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
6. Describe the roles and responsibilities of employers and employees with respect to the selection and use of personal protective equipment (PPE).
7. Select, use and maintain appropriate PPE for worksite applications.

**B. Climbing, Lifting, Rigging and Hoisting ..... 3 Hours**

**Outcome:**      *Describe the use of personal protective equipment (PPE) and safe practices for climbing, lifting, rigging and hoisting in this trade.*

1. Select, use and maintain specialized PPE for climbing, lifting and load moving equipment.
2. Describe manual lifting procedures using correct body mechanics.
3. Describe rigging hardware and the safety factor associated with each item.
4. Select the correct equipment for rigging typical loads.
5. Describe hoisting and load moving procedures.

**C. Hazardous Materials & Fire Protection..... 2 Hours**

**Outcome:**      *Describe the safety practices for hazardous materials and fire protection in this trade.*

1. Describe the roles, responsibilities features and practices related to the workplace hazardous materials information system (WHMIS) program.
2. Describe the three key elements of WHMIS.
3. Describe handling, storing and transporting procedures when dealing with hazardous material.
4. Describe safe venting procedures when working with hazardous materials.
5. Describe fire hazards, classes, procedures and equipment related to fire protection.

**D. Trade Safety ..... 10 Hours****Outcome:**     *Apply safe work practices.*

1.     Demonstrate maintenance procedures for tools.
2.     Describe procedures for responding to and documenting incidents and accidents.
3.     Describe lock-out and tag-out procedures.
4.     Explain the effects of electricity and precautions used to prevent injury.

**E. Hand Tools ..... 8 Hours****Outcome:**     *Use hand tools for fabricating metal.*

1.     Describe safety precautions for hand tools.
2.     Identify hand tools for fabricating metal.
3.     Identify layout and measuring tools and their uses.
4.     Identify clamping tools and their uses.
5.     Identify cutting tools and their uses.
6.     Use taps and dies to make threads.

**F. Power Tools ..... 5 Hours****Outcome:**     *Use power tools for fabricating metal.*

1.     Describe the operating procedures for metal forming and shaping tools.
2.     Describe the operating procedures for metal cutting power tools.
3.     Describe the application of electrical, hydraulic and pneumatic tools.
4.     Operate bench, pedestal, angle and straight grinders.
5.     Operate portable power drills, twist drills and drill presses.

**G. Rigging ..... 14 Hours****Outcome:**     *Apply rigging practices.*

1.     Define rigging terms.
2.     Demonstrate tying knots and hitches.
3.     Describe sling, wire rope and chain lifting configurations.
4.     Calculate working load limit (WLL) of rigging equipment.
5.     Use wire rope, synthetic slings and chains.
6.     Inspect rigging and hoisting equipment for damage.

**H. Hoisting and Material Handling ..... 7 Hours****Outcome:**     *Demonstrate hoisting and material handling procedures.*

1.     Describe the differences between hoisting and lifting.
2.     Identify cranes and their capacities.
3.     Describe safety procedures for forklifts, work platforms and ladders.
4.     Describe transfer tables and conveyors.

5. Explain procedures for storing and stacking materials.
6. Demonstrate signals for lifting and hoisting.
7. Demonstrate the procedures for rigging and hoisting.

**SECTION TWO:.....LAYOUT AND FABRICATION..... 70 HOURS**

**A. Introduction to Layout ..... 30 Hours**

**Outcome:**     *Demonstrate layout procedures.*

1. Identify terms and symbols associated with drafting and layout.
2. Identify the components of a circle.
3. Layout geometric constructions using drafting and layout tools.
4. Construct an ellipse using the trammel method.
5. Describe principles of parallel line development.
6. Identify patterns for piping and square tubing cut on an angle.

**B. Template and Material Mark-Up ..... 10 Hours**

**Outcome:**     *Use templates and material mark-up procedures.*

1. Describe symbols and abbreviations used in material mark-up and template development.
2. Describe the purpose of different markers.
3. Describe mark-up procedures for fabrication processes.
4. Describe types of and materials for templates.
5. Explain the procedures for establishing a square corner.
6. Describe material nesting.

**C. Fabrication ..... 18 Hours**

**Outcome:**     *Fabricate a structural component.*

1. Identify the components of a steel structure.
2. Define terms associated with structural steel fabrication.
3. Describe the procedure for checking a fabricated component for squareness.
4. Fabricate a structural component.

**D. Basic Pressure Vessels ..... 12 Hours**

**Outcome:**     *Demonstrate vessel layout.*

1. State the Canadian Standards Association (CSA) definition and general classifications of pressure vessels.
2. Identify the five types and functions of unfired pressure vessels.
3. Describe the components of a pressure vessel.
4. Define American Society of Mechanical Engineers (ASME) and American Society for Testing Materials (ASTM).
5. Identify the ASME sections detailing pressure vessel fabrication.
6. Define grain direction and how it relates to the forming process.

7. Calculate plate lengths for rolling cylinders.
8. Demonstrate vessel layout.

**SECTION THREE: ..... MATH AND DRAWING INTERPRETATION ..... 66 HOURS**

**A. Drawing Standards ..... 28 Hours**

**Outcome:** *Interpret drawings.*

1. Identify the elements of a drawing.
2. Define running, group, conventional and standard dimensions.
3. Describe the purpose of the alphabet of lines.
4. Illustrate multi view, third angle, orthographic and isometric projections.
5. Describe care and storage of drawings.
6. Create drawings using drafting standards and techniques.
7. Interpret drawings using drafting standards and techniques.
8. Develop a material take-off from a structural drawing.

**B. Material Designations ..... 16 Hours**

**Outcome:** *Identify the types and uses of construction materials.*

1. Describe steel products and designations.
2. Calculate weight of structural shapes.
3. Describe types and grades of steel and alloys.
4. Explain procedures for sizing and ordering grating.
5. Describe dimensional properties of pipe.
6. Describe methods of manufacturing and marking pipe.
7. Describe types, uses and marking system of pipe fittings.
8. Identify types of fasteners used in structural and vessel industries.
9. Calculate bolt and stud lengths.

**C. Trade Mathematics ..... 22 Hours**

**Outcome:** *Solve math problems.*

1. Solve problems using whole numbers, fractions and decimals.
2. Convert between decimal and fractional values.
3. Solve ratio and direct/indirect proportion problems.
4. Solve perimeter, area and volume problems.
5. Convert between metric and imperial numbers.

## SECTION FOUR: ..... CUTTING, WELDING AND METALLURGY ..... 51 HOURS

## A. Cutting ..... 19 Hours

**Outcome:**     *Demonstrate cutting processes.*

1.     Describe the construction and handling procedures of compressed gas cylinders.
2.     Describe the construction and operating procedures of oxy-fuel systems.
3.     Explain the purpose of a manifold system.
4.     Describe the design, application and care of cutting tips.
5.     List causes of backfires and flashbacks.
6.     Identify cutting processes and equipment.
7.     Operate oxy-fuel cutting systems.

## B. Welding ..... 22 Hours

**Outcome:**     *Demonstrate welding processes.*

1.     Identify welding processes, equipment and accessories.
2.     Define open circuit voltage, arc voltage, alternating current, direct current, resistance and polarity.
3.     List the advantages and disadvantages of welding processes and components.
4.     Describe the designations and properties of consumable electrodes.
5.     Describe safety requirements specific to welding.

## C. Metallurgy ..... 10 Hours

**Outcome:**     *Describe properties of metals.*

1.     Describe physical and chemical properties of metals.
2.     Describe the chemical composition of steel.
3.     Describe classification of steel.

**SECOND PERIOD TECHNICAL TRAINING  
METAL FABRICATOR (FITTER) TRADE  
COURSE OUTLINE**

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE WILL BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

**SECTION ONE:.....MATERIAL HANDLING AND EQUIPMENT OPERATIONS ..... 60 HOURS**

**A. Equipment Operations ..... 44 Hours**

**Outcome:**     *Operate fabrication equipment.*

1. Identify types, operating procedures and capacities of stationary metal fabrication equipment.
2. Identify types, operating procedures and capacities of portable metal fabrication equipment.
3. Describe types of thread and threading procedures.
4. Describe metal forming.
5. Demonstrate metal forming practices.
6. Operate metal fabrication equipment.

**B. Hoisting and Material Handling ..... 12 Hours**

**Outcome:**     *Operate material handling equipment.*

1. Explain the operation of air hoists, block and tackle chain falls, come-alongs and tirlors.
2. Operate air hoists, block and tackle chain falls, come-alongs and tirlors.

**C. New Technology ..... 4 Hours**

**Outcome:**     *Describe advancements in fabrication technology.*

1. Describe advancements in fabrication technology.

**SECTION TWO:.....LAYOUT AND FABRICATION ..... 62 HOURS**

**A. Pattern Development..... 22 Hours**

**Outcome:**     *Apply principles of pattern development.*

1. Explain principles of triangulation.
2. Create wraparound templates using parallel line development.
3. Create bending templates using radial line development.
4. Create stretch-out templates by applying bend allowance and mean diameter calculations.

**B. Fabrication ..... 40 Hours**

**Outcome:**     *Fabricate pressure vessels and structural steel.*

1. Interpret principles of vessel layout and fabrication.
2. Apply principles of vessel layout and fabrication.
3. Interpret principles of metal forming.
4. Apply principles of metal forming.

5. Interpret principles for miscellaneous metal layout and fabrication.
6. Apply principles for miscellaneous metal layout and fabrication.
7. Interpret principles for structural steel layout and fabrication.
8. Apply principles for structural steel layout and fabrication.

**SECTION THREE: ..... MATH AND DRAWING INTERPRETATION ..... 54 HOURS**

**A. Drawing Standards ..... 24 Hours**

**Outcome:** *Interpret intermediate level drawings.*

1. Interpret intermediate level drawings.

**B. Welding Abbreviations and Symbols ..... 8 Hours**

**Outcome:** *Interpret welding symbols.*

1. Identify welding symbols.
2. Explain parts of a welding symbol.
3. Define welding abbreviations.

**C. Trade Mathematics ..... 22 Hours**

**Outcome:** *Solve intermediate level math problems.*

1. Solve intermediate problems using whole numbers, fractions and decimals.
2. Solve intermediate problems concerning ratio and direct/indirect proportion.
3. Solve intermediate problems relating to perimeter, area and volume.
4. Calculate percentages including simple interest, discounts and successive discounts.

**SECTION FOUR: ..... CUTTING, WELDING AND METALLURGY ..... 64 HOURS**

**A. Cutting ..... 28 Hours**

**Outcome:** *Demonstrate intermediate level cutting processes.*

1. Describe the equipment and operating procedures required for oxy-fuel, plasma and carbon arc cutting and gouging.
2. Demonstrate the equipment and operating procedures required for oxy-fuel, plasma and carbon arc cutting and gouging.
3. Demonstrate piercing and cutting of a bolt hole to size.
4. Prepare materials using joint configurations.

**B. Welding ..... 24 Hours**

**Outcome:** *Demonstrate intermediate level welding processes.*

1. Explain which welds apply to butt, lap, corner, edge and tee joints.
2. Explain causes of distortion.
3. Identify weld faults and their causes.
4. Describe the equipment, operating procedures and advantages of stud welding.

5. Describe the equipment, operating procedures and advantages of wire process welding.
6. Demonstrate joint preparation and tacking procedures of components.

**C. Metallurgy ..... 12 Hours**

**Outcome:**      *Describe properties of metal.*

1. Describe the effect of heating and cooling metal.
2. Describe bend, file, spark and hardness tests.
3. Describe steel colour changes during heating processes.
4. Explain the purpose of pre and post metal heating procedures.
5. Describe the effects of quenching on steel hardness measured in Brinnell or Rockwell scales.
6. Describe the effects of metal chemical composition on welding and cutting processes.
7. Describe how forging affects the grain size and structure of metal.
8. Describe methods for heat straightening different metal shapes and components.

THIRD PERIOD TECHNICAL TRAINING  
METAL FABRICATOR (FITTER) TRADE  
COURSE OUTLINE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE WILL BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE:.....LAYOUT AND FABRICATION..... 140 HOURS

A. Pattern Development..... 18 Hours

**Outcome:**     *Apply principles of advanced pattern development.*

1.     Create stretch-out templates for true wye and lateral connections using parallel line development.
2.     Create stretch-out templates for cones, pyramids and truncated frustums using radial line development.
3.     Calculate slant height, true length, angle of stretch out, altitude to apex (when given frustum dimensions) and chord length for cones and frustums of cones.
4.     Apply principles of triangulation when creating templates square to round transitions.

B. Fabrication ..... 122 Hours

**Outcome:**     *Implement advanced fabrication procedures for pressure vessels and structural steel.*

1.     Interpret principles of vessel layout and fabrication.
2.     Apply principles of vessel layout and fabrication.
3.     Interpret principles of metal forming.
4.     Apply principles of metal forming.
5.     Interpret principles for miscellaneous metal layout and fabrication.
6.     Apply principles for miscellaneous metal layout and fabrication.
7.     Interpret principles for structural steel layout and fabrication.
8.     Apply principles for structural steel layout and fabrication.
9.     Explain the importance of preparing joints and following welding procedures when constructing fabricated components.
10.    Describe fabrication procedures using clad steels.
11.    Apply code requirements when fabricating metal.

SECTION TWO:.....MATH AND DRAWING INTERPRETATION ..... 54 HOURS

A. Drawing Standards ..... 30 Hours

**Outcome:**     *Interpret advanced drawings.*

1.     Interpret advanced drawings.
2.     Use advanced drawings to check a fabricated component.

**B. Trade Mathematics ..... 20 Hours****Outcome:** *Solve advanced level math problems.*

1. Apply trigonometric functions.
2. Describe complementary angles using sine, cosine and tangent functions.
3. Solve practical application problems related to layout and fabrication.
4. Solve trade related problems involving areas, volumes, capacities, mass and linear measurements.

**C. Trade Applied Computation ..... 4 Hours****Outcome:** *Prepare a project bid.*

1. Prepare material take-offs.
2. Calculate labour and production costs.
3. Prepare a project bid.

**SECTION THREE: .....QUALITY CONTROL AND CODES ..... 46 HOURS****A. Quality Control (QC) ..... 8 Hours****Outcome:** *Describe purpose and methods of quality assurance and control.*

1. Define quality assurance.
2. Define quality control.
3. Describe the elements of a QC system.
4. Explain the function of standards and codes.

**B. Inspection Methods ..... 9 Hours****Outcome:** *Describe inspection methods.*

1. Describe types and stages of inspection.
2. Describe non-conformances during each stage of inspection.
3. Describe the economic value of each stage of inspection.
4. Identify templates and gauges used for visual inspection.
5. Describe process for handling inspection reports.

**C. Protective Coatings for Steel ..... 4 Hours****Outcome:** *Describe protective coatings for steel.*

1. Describe protective coatings and methods of inspection.
2. Describe causes of rusting.
3. Describe preparation of metals prior to coating.
4. Describe the galvanizing process.

THIRD PERIOD

D. Codes, Standards and Design ..... 10 Hours

**Outcome:** *Interpret industry codes, standards and design principles.*

1. Interpret the American Petroleum Institute (API), Canadian Institute of Steel Construction (CISC), CSA and ASME codes as they relate to metal fabrication.
2. Define design stresses related to structural components and vessels.

E. Business Practices ..... 6 Hours

**Outcome:** *Describe industry business procedures.*

1. Interpret written orders and requests.
2. Describe workplace responsibilities.

F. Workplace Coaching Skills ..... 6 Hours

**Outcome:** *Display coaching skills.*

1. Describe coaching skills used for training apprentices.

G. Alberta's Industry Network ..... 1 Hour

**Outcome:** *Describe the role of the Alberta and Industry Training Board and the network of industry committees that represent the trades and occupations in Alberta.*

1. Describe Alberta's apprenticeship and industry training system.
2. Describe the roles and responsibilities of the Alberta Apprenticeship and Industry Training Board, government and post-secondary institutions.
3. Describe the roles and responsibilities of the PACs, LACs and occupational committees.

H. Interprovincial Standards Red Seal Program ..... 2 Hours

**Outcome:** *Use Red Seal products to challenge an Interprovincial examination.*

1. Identify Red Seal products used to develop Interprovincial examinations.
2. Use Red Seal products to prepare for an Interprovincial examination.



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